SUPPRESSION OF BAFFLE-STABILIZED POOL FIRES

by

William Grosshandler
Building and Fire Research Laboratory
National Institute of Standards and Technology
Gaithersburg, MD 20899 USA

Reprinted from the Fire Safety Science. Proceedings. Sixth (6th) International Symposium. International Association for Fire Safety Science (IAFSS). POSTER ABSTRACTS. July 5-9, 1999, Poitiers, France, Intl. Assoc. for Fire Safety Science, Boston, MA, Curtat, M., Editor, 198-1198 pp, 2000.

NIST
National Institute of Standards and Technology
Technology Administration, U.S. Department of Commerce

SUPPRESSION OF BAFFLE-STABILIZED POOL FIRES[*]

WILLIAM L. GROSSHANDLER
National Institute of Standards and Technology
Gaithersburg, Maryland 20899 U.S.A.

ABSTRACT

The extinguishment of a fire in an aircraft engine nacelle varies greatly with geometry and fire type. If fuel is allowed to collect behind an obstacle in the vicinity of a hot surface, a significantly higher mass of agent is necessary for sustained suppression. A Transient Application, Recirculating Pool Fire (or TARPF) suppression facility has been developed in the current study to screen different agents and prototype systems, and as an indicator of full-scale performance. The TARPF agent suppression screen is designed to reproduce the most difficult fire situation and to allow control of critical agent discharge parameters, including discharge rate, duration and air flow. The performance of gaseous agents and solid-propellant gas generators can be examined in gram quantities; and relationships between the mass of agent necessary for sustained suppression, and agent injection duration, temperature of the hot surface, and obstacle geometry can be explored. The TARPF apparatus consists of a horizontal wind tunnel with a square cross-section 92 mm on a side. Air supplied by a compressor is delivered to the tunnel at nominal speeds up to 17 m/s. A porous bronze burner, 92 mm wide by 190 mm long, is located on the floor of the tunnel test section. Propane is the primary fuel, which can be supplemented by a JP-8 spray, with total heat release rates up to 10 kW. Different height baffles or a backward facing step are placed just upstream of the propane pool to create a large recirculation zone. An electric strip heater designed to reach 500 ^{o}C simulates a hot surface reignition point, and is located upstream or downstream of the pool. The agent is injected radially into a reduced diameter entrance region upstream of the obstacles. Since the air flow is choked in the metering orifice plate, the introduction of the agent can be accomplished without altering the total air flow. A pressure vessel is used to store gaseous agent. The discharge rate and duration are controlled by the initial agent pressure and an electronically actuated solenoid valve. Results are presented to demonstrate the impact of the following key parameters on suppression performance by alternative agents: air flow, fuel flow, agent injection interval, baffle height, and hot surface temperature.

KEY WORDS: suppression, halon alternatives, test methods

---

[*] Work sponsored by the U.S. Department of Defense Next Generation Program